

MYCOTIC ANEURYSMS IN INTRAVENOUS DRUG ABUSE: DIAGNOSIS AND MANAGEMENT

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Mycotic aneurysms are caused by microorganisms in the vessel wall. The most commonly reported cause of mycotic aneurysms today is intravenous drug abuse. The diagnosis should be entertained whenever a mass is encountered over a major vessel in an intravenous drug abuser. The clinical findings often include a tender, pulsatile mass overlying an artery. The single best diagnostic test is the arteriogram. The treatment is based on early exploration with debridement of all necrotic and infected tissue, effective drainage, and appropriate antibiotic coverage.

Restoration of vascular continuity is desirable when possible, and necessary when the viability of the extremity requires it. When reconstitution of the vessel is contemplated, the following principles are advocated (1) resection of all nonviable arterial wall, (2) use of monofilament synthetic suture, (3) achievement of a tension-free anastomosis with or without the use of autogenous grafts, (4) effective local drainage, and (5) appropriate antibiotic coverage.

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Vascular complications secondary to parenteral drug abuse are being seen with increased frequency. One of these, mycotic aneurysm, poses the risk of extensive hemorrhage sepsis and possible loss of limb or life. There is, therefore, great urgency in accurately making the diagnosis and effecting appropriate treatment.

A sizeable portion of surgical patients at the District of Columbia General Hospital are intravenous drug abusers. Three of these presented recently with painfully enlarging masses. These cases are presented to illustrate the problem, its diagnosis, and its treatment.

SUBJECTS AND METHODS

Three patients recently admitted and treated at DC General Hospital with the diagnosis of mycotic aneurysms secondary to parenteral drug abuse illustrate the problem and its treatment. The case reports of these patients are summarized below.

Case Reports

Case 1. The patient was a 36-year-old, black man with an 18-year history of intravenous drug use. Five days prior to admission, he attempted injection into his right antecubital fossa. He subsequently developed swelling, induration, erythema, and pain. On initial examination in the clinic, no pulsations, bruit or thrill could be

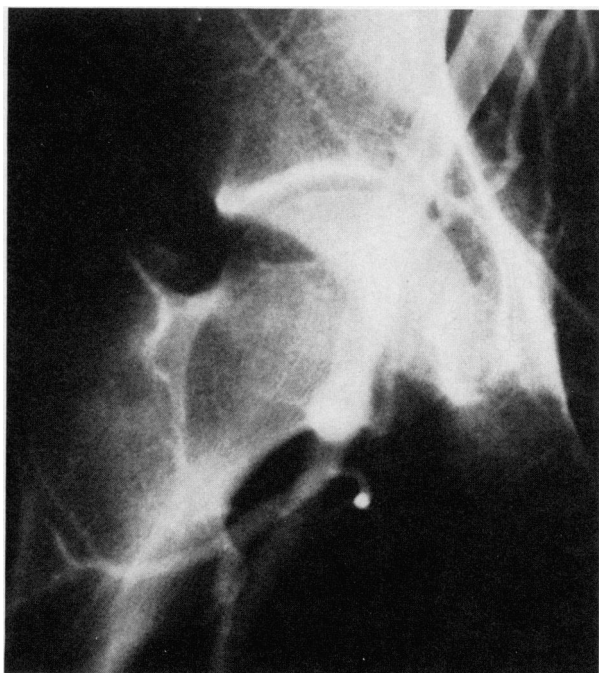


Figure 1. Left femoral arteriogram demonstrating a false aneurysm just proximal to the bifurcation of the common femoral artery

appreciated over the mass. Needle aspiration yielded 10 cc of pus. In the operating room, incision and drainage released 300 cc of purulent material. Over the ensuing five days, he was maintained on broad-spectrum antibiotics and routine wound care, and was noted to be improving.

Subsequently, he was found to be bleeding from his open wound. The wound was explored in the operating room where suture ligation and electrocautery of superficial bleeders achieved hemostasis. Two days later he had a second, and more vigorous, hemorrhage. Exploration of the wound in the operating room under tourniquet identified a blowout of the anterior wall of the brachial artery just proximal to the bifurcation. This area was resected for 2 cm to viable vessel and an end-to-end arterial anastomosis was effected with a continuous stitch of 5 "O" prolene suture. The vessel and anastomotic site were covered with loosely approximated soft tissue. The subcutaneous tissue was left open and the arm was splinted in flexion. Within one week, he was discharged home in good condition and was maintained on oral antibiotics

for two weeks. The patient went on to full recovery in two months.

Case 2. The patient was a 35-year-old, black man with a 14-year history of intravenous drug abuse. Seven days prior to admission, he noted that he had a fever and a painful mass in the area of a recent injection into his groin. On admission, his examination revealed a temperature of 104° F and a tender, pulsatile 3 cm mass over the left femoral artery. Neither bruit nor thrill could be appreciated. An arteriogram was obtained (Figure 1) and he was explored the same day in the operating room.

Proximal control was effected by extraperitoneal abdominal exposure of the external iliac artery. Distal control was obtained on both the superficial and deep femoral arteries via an oblique thigh incision. Exploration of the mass was performed and a defect in the posterior wall of the left common femoral artery was found to communicate with an infected hematoma. The femoral artery was debrided and resected to viable vessel. Length was gained by freeing up the external iliac artery, and an end-to-end tension-free anastomosis was effected with a continuous stitch of 5 "O" prolene suture. Soft tissue was loosely approximated over the anastomosis and the artery. The wound was irrigated with antibiotic solution; the subcutaneous tissue was left open; and a Jackson-Pratt drain was placed in the extraperitoneal space.

Wound cultures grew *Staphylococcus aureus*, and the patient was continued on broad-spectrum coverage. He was discharged after an uneventful postoperative course.

Case 3. The patient was a 38-year-old, black man with a three-year history of parenteral drug abuse. Seven days prior to admission, he noted a painful, enlarging mass in his right antecubital fossa where he had recently injected. He was transferred to the DC General Hospital from another hospital with a diagnosis of an abscess. Physical examination was remarkable for a pulsatile, tender, fluctuant mass with a bruit over the antecubital fossa. Distal pulses were noted to be decreased and the arm was swollen. An arteriogram was performed (Figure 2), which confirmed the clinical impression of mycotic aneurysm.

The left arm and right leg were prepped and draped. Proximal control was obtained on the

brachial artery through a longitudinal skin incision parallel to the brachial artery, using pulsation in the vessel as a guide to dissection. The hematoma was entered revealing approximately 300 cc of clotted blood and perforation in two locations on the anterior surface of the distal brachial artery. After local debridement and resection of 4 cm of diseased vessel, end-to-end anastomosis could not be achieved without tension. An autogenous, saphenous vein graft, harvested from the right leg, was reverse interposed and sutured end to end proximally, and side to end distally, with a continuous stitch of 5 "O" prolene suture.

Soft tissue was closed over the artery and graft, and the subcutaneous tissue was left open. He was discharged without further complications and went on eventually to full recovery.

DISCUSSION

The term mycotic aneurysm initially was applied to an aneurysm that resulted from the migration of septic emboli to peripheral vessels in cases of bacterial endocarditis.¹ The term now encompasses those aneurysms—true and false—that are associated with an infection in the wall as a primary or secondary process.²

Described etiologies include septic embolization, secondary infection of an existing atherosclerotic aneurysm, local direct arterial infection, infected pseudoaneurysm, syphilitic thoracic aneurysm, tuberculous aneurysm, and fungal aneurysm.² Formerly, the most common etiology was via septic embolization from bacterial endocarditis. The most common cause of a mycotic aneurysm is now reported to be parenteral drug abuse.³

Repeated arterial wall puncture and infection of the arterial wall are associated with bleeding and hematoma formation. The ensuing hematoma then may become infected. Unsterile technique, drugs and equipment play a significant role, undoubtedly, in the development of this complication in drug addicts. The resultant infection causes liquefaction of the central portion of the hematoma. This may communicate with the artery forming the pseudoaneurysm.^{3,4}

Intraarterial injections, while often inadvertent in the extremities, often are intended in the neck.



Figure 2. Right brachial arteriogram demonstrating a false aneurysm and a soft-tissue mass over the distal brachial artery

This is especially true if the superficial veins are thrombosed. The most common findings on presentation include a history of injections in an area over a major artery, fever, an enlarging painful mass and, occasionally, complaints of ischemia.³ Prominent clinical findings are of a tender, pulsatile mass in the area of an artery that also may be associated with erythema, bruit and thrill, petichiae, decrease in distal pulses, and evidence of ischemia.^{3,5} An indurated mass alone in an intravenous drug abuser over a major vessel in the absence of any other more specific signs may often be the only finding.

Leukocytosis and positive blood cultures usually can be found. The most common organism in drug addicts was reported to be *Staphylococcus aureus*, but streptococcus, pneumococcus, pseudomonas, and enterococcus can be found.^{5,6}

Diagnostic possibilities most often include lymphadenitis, thrombophlebitis, simple abscesses, and hematomas. The potential for massive, uncontrolled hemorrhage mandates that mycotic aneurysms be considered in the differential diagnosis of any mass in proximity to a major vessel in a drug abuser.

The definitive diagnostic test is the arteriogram, and it should probably be utilized in anyone in whom the possibility of a mycotic aneurysm exists.^{3,5}

The early use of the arteriogram in the suspected case can prevent unnecessary delay in beginning treatment and giving inappropriate treatment. It facilitates planning for definitive treatment.^{3,4}

The importance of a high index of suspicion and of obtaining early diagnosis is well illustrated in the first case, where delay and inaccuracy in diagnosis contributed to increased morbidity and near mortality.

The treatment consists of early surgical intervention and parenteral antibiotics. Antibiotic treatment is directed toward gram-positive and gram-negative aerobic and anaerobic organisms, especially *Staphylococcus aureus*.^{2,5} Surgical treatment includes obtaining proximal and distal control of the artery, excision of all necrotic and infected material, adequate drainage, leaving the wound open, and maintenance of an adequate distal flow.^{3,5,6}

Primary vascular reconstruction is controversial. Most authors now advocate debridement, drainage, and ligation of the artery, with reconstitution, if needed, in another operation.^{3,5,6} This is predicated on the usual presence of sufficient collateral flow to maintain limb viability and on the reported high experience of complications of the primary repair.⁶ The complications reported include hemorrhage secondary to disruptions at the site of the arterial repair, septic embolization, and infection of prosthetic graft material.⁶ In Feldman's series of 23 patients who underwent revascularization, there were one death and four amputations. In the group who underwent simple excision

and ligation, there were no deaths and five amputations among 30 patients.⁶

Ligation, debridement, and drainage are clearly indicated at the initial surgery when, after resection of the diseased vessel, a graft is needed and no suitable autogenous material is available. This approach also has been proposed in poor risk patients in whom a longer operation may be undesirable. Given the high rate of subsequent amputation when ligation is practiced, an attempt, when possible, should be made to restore vascular integrity at the initial operation with ligation probably reserved for failure.

Successful, initial, vascular reconstruction without the reported high incidence of complications is definitely possible in our experience at the DC General Hospital as demonstrated in the three patients described, so long as certain principles are practiced. These include: (1) aggressive broad-spectrum antibiotic coverage, including coverage for *Staphylococcus aureus*; (2) effective debridement of all grossly diseased vessels and nonviable adjacent tissue; (3) tension-free anastomosis; (4) use of autogenous vein grafts when needed; (5) leaving all skin and subcutaneous tissue open with soft tissue loosely covering the vessels; and (6) use of monofilament synthetic suture.

If the above principles are practiced, primary vascular reconstruction remains a viable option in the management of parenteral drug-abuse-related mycotic aneurysms.

In the appropriate circumstances, this approach may be the preferred modality as indicated by the success in the above three reported cases.

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